

# Radar Level Sensor

## User Manual



**SKU: SUCH-RLS-RD909**

## Preface

Thank you for purchasing radar level transmitter. Please read this manual carefully before operating and using it correctly to avoid unnecessary losses caused by false operation.

### Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate, if you find something wrong or incorrect, please contact us.
- This product is forbidden to use in explosion-proof occasions.

## **Safety Precautions**

In order to use this product safely, be sure to follow the safety precautions described.

### **About this manual**

- Please submit this manual to the operator for reading.
- Please read the operation manual carefully before applying the instrument. On the precondition of full understanding.
- This manual only describes the functions of the product. The company does not guarantee that the product will be suitable for a particular use by the user.

### **Precautions for protection, safety and modification of this product**

- To ensure safe use of this product and the systems it controls, Please read carefully the operation manual and understand the correct application methods before putting into operation, to avoid unnecessary losses due to operation mistakes. If the instrument is operated in other ways not described in the manual, the protections that the instrument give may be destroyed, and the failures and accidents incurred due to violation of precautions shall not be borne by our company.
- When installing lightning protection devices for this product and its control system, or designing and installing separate safety protection circuits for this product and its control system, it needs to be implemented by other devices.
- If you need to replace parts of the product, please use the model specifications specified by the company.
- This product is not intended for use in systems that are directly related to personal safety. Such as nuclear power equipment, equipment using radioactivity, railway systems, aviation equipment, marine equipment, aviation equipment and medical equipment. If applied, it is the responsibility of the user to use additional equipment or systems to ensure personal safety.
- Do not modify this product.

- The following safety signs are used in this manual:



Hazard, if not taken with appropriate precautions, will result in serious personal injury, product damage or major property damage.



Warning: Pay special attention to the important information linked to product or particular part in the operation manual.



- Confirm if the supply voltage is in consistent with the rated voltage before operation.
- Don't use the instrument in a flammable and combustible or steam area.
- To prevent from electric shock, operation mistake, a good grounding protection must be made.
- Thunder prevention engineering facilities must be well managed: the shared grounding network shall be grounded at is-electric level, shielded, wires shall be located rationally, SPD surge protector shall be applied properly.
- Some inner parts may carry high voltage. Do not open the square panel in the front except our company personnel or maintenance personnel acknowledged by our company, to avoid electric shock.
- Cut off electric powers before making any checks, to avoid electric shock.
- Check the condition of the terminal screws regularly. If it is loose, please tighten it before use.
- It is not allowed to disassemble, process, modify or repair the product without authorization, otherwise it may cause abnormal operation, electric shock or fire accident.
- Wipe the product with a dry cotton cloth. Do not use alcohol, benzine or other organic solvents. Prevent all kinds of liquid from splashing on the product. If the product falls into the water, please cut off the power

immediately, otherwise there will be leakage, electric shock or even a fire accident.

- Please check the grounding protection status regularly. Do not operate if you think that the protection measures such as grounding protection and fuses are not perfect.
- Ventilation holes on the product housing must be kept clear to avoid malfunctions due to high temperatures, abnormal operation, shortened life and fire.
- Please strictly follow the instructions in this manual, otherwise the product's protective device may be damaged.



- Don't use the instrument if it is found damaged or deformed at opening of package.
- Prevent dust, wire end, iron fines or other objects from entering the instrument during installation, otherwise, it will cause abnormal movement or failure.
- During operation, to modify configuration, signal output, startup, stop, operation safety shall be fully considered. Operation mistakes may lead to failure and even destruction of the instrument and controlled equipment.
- Each part of the instrument has a certain lifetime, which must be maintained and repaired on a regular basis for long-time use.
- The product shall be scrapped as industrial wastes, to prevent environment pollution.
- When not using this product, be sure to turn off the power switch.
- If you find smoke from the product, smell odor, abnormal noise, etc., please turn off the power switch immediately and contact the company in time.

**Disclaimer**

- The company does not make any guarantees for the terms outside the scope of this product warranty.
- This company is not responsible for damage to the instrument or loss of parts or unpredictable damage caused directly or indirectly by improper operation of the user.

No.	Name	Quantity	Note
1	Radar level transmitter	1	
2	Manual	1	
3	Certificate	1	

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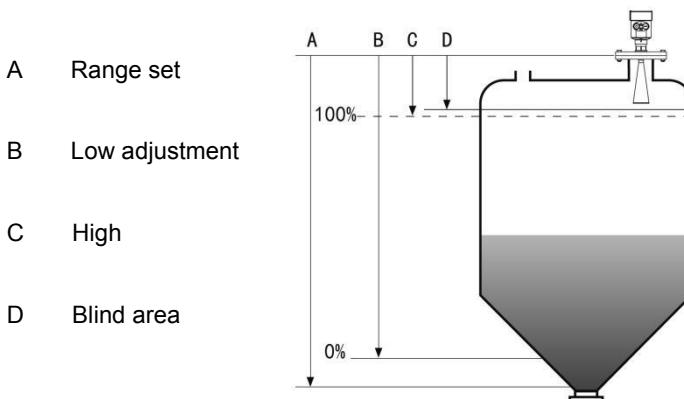
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## Chapter 1 Introduction

This series of radar level meter adopted 26G high frequency radar sensor, the maximum measurement range can reach up to 70 meters. Antenna is optimized further processing, the new fast microprocessors have higher speed and efficiency can be done signal analysis, the instrumentation can be used for reactor, solid silo and very complex measurement environment.

### 1.1 Working Principle

Radar level transmitter antenna microwave pulse is narrow, the downward transmission antenna. Microwave exposure to the medium surface is reflected back again by the antenna system receives, sends the signal to the electronic circuit automatically converted into level signals (because the microwave propagation speed, electromagnetic wave to reach the target and the reflected back to the receiver this time is almost instantaneous).



**Datum measurement:** Screw thread bottom or the sealing surface of the flange.

**Note:** Make sure the radar level meter the highest level cannot enter the measuring blind area (Figure D shown below).

## 1.2 The characteristics of 26G radar level meter

- (1) Small antenna size, easy to install; non-contact radar, no wear, no pollution.
- (2) Almost no corrosion, bubble effect; almost not affected by water vapor in the atmosphere, the temperature and pressure changes.
- (3) Serious dust environment on the high level meter work has little effect.
- (4) A shorter wavelength, the reflection of solid surface inclination is better.
- (5) Beam angle is small, the energy is concentrated, can enhance the ability of echo and to avoid interference.
- (6) The measuring range is smaller, for a measurement will yield good results.
- (7) High signal noise ratio, the level fluctuation state can obtain a better performance.
- (8) High frequency measurement of solids and low dielectric constant of the medium.

## Chapter 2 Technical Parameters

### 2.1 RD901



Application: Corrosive liquid  
Measuring range: 10 meters  
Process connection: Thread, flange  
Process temperature: -40°C~130°C  
Process pressure: -0.1 ~ 0.3 MPa  
Accuracy:  $\pm$  5mm  
Ingress protection: IP67  
Frequency range: 26GHz  
Supply: 2-wire (DC24V) / 4-wire (DC24V /AC220V)  
Signal output: 4-20mA /HART (2-wire / 4-wire)  
RS485/ Modbus

### 2.2 RD902



Application: Slightly corrosive liquid  
Measuring range: 30 meters  
Process connection: Thread, flange  
Process temperature: -40°C~250°C  
Process pressure: -0.1 ~ 4.0 MPa  
Accuracy:  $\pm$  3mm  
Ingress protection: IP67  
Frequency range: 26GHz  
Supply: 2-wire (DC24V) / 4-wire (DC24V /AC220V)  
Signal output: 4-20mA /HART (2-wire / 4-wire)  
RS485/ Modbus  
Outer covering: Aluminum / plastic / stainless steel

### 2.3 RD902T



Application: Temperature resistant, pressure resistant, slightly corrosive liquid

Measuring range: 20 meters

Process connection: Thread, flange

Process temperature: -40°C~130°C (standard type);  
-40°C~250°C (high temperature type)

Process pressure: -0.1 ~ 2.0 MPa

Accuracy: ± 3mm

Ingress protection: IP67

Frequency range: 26GHz

Supply: 2-wire (DC24V) / 4-wire (DC24V /AC220V)

Signal output: 4-20mA / RS485/ Modbus

### 2.4 RD903



Application: Solid material, strong dust, easy to crystallize, condensation occasion

Measuring range: 70 meters

Process connection: Universal flange

Process temperature: -40°C~250°C

Process pressure: -0.1 ~ 0.3 MPa (universal flange);  
-0.1~4.0 MPa (flat flange)

Accuracy: ± 15mm

Ingress protection: IP67

Frequency range: 26GHz

Supply: 2-wire (DC24V) / 4-wire (DC24V /AC220V)

Signal output: 4-20mA / RS485/ Modbus

**2.5 RD904**

Application: Temperature resistant, pressure resistant, slightly corrosive liquid

Measuring range: 80 meters

Process connection: Thread, flange

Process temperature: -40°C~250°C

Process pressure: -0.1 ~ 0.3 MPa

Accuracy:  $\pm 15\text{mm}$

Ingress protection: IP67

Frequency range: 26GHz

Supply: 2-wire (DC24V) / 4-wire (DC24V /AC220V)

Signal output: 4-20mA /RS485/ Modbus

**2.6 RD905**

Application: Solid particles, powder

Measuring range: 30 meters

Process connection: Thread, Flange

Process temperature: -40°C~250°C

Process pressure: -0.1~4.0 MPa (flat flange);

-0.1 ~ 0.3 MPa (universal flange)

Accuracy:  $\pm 10\text{mm}$

Ingress protection: IP67

Frequency range: 26GHz

Supply: 2-wire (DC24V) / 4-wire (DC24V /AC220V)

Signal output: 4-20mA /RS485/ Modbus

**2.7 RD906**

Application: Hygienic liquid storage,  
Corrosive container  
Measuring range: 20 meters  
Process connection: Flange  
Process temperature: -40°C~150°C  
Process pressure: Normal pressure  
Accuracy:  $\pm 3\text{mm}$   
Ingress protection: IP67  
Frequency range: 26GHz  
Supply: 2-wire (DC24V) / 4-wire (DC24V / AC220V)  
Signal output: 4-20mA /RS485/ Modbus

**2.8 RD908**

Application: Rivers, lakes, shoal  
Measuring range: 30 meters  
Process connection: Thread G1½" A/frame /flange  
Process temperature: -40°C~100°C  
Process pressure: Normal pressure  
Accuracy:  $\pm 3\text{mm}$   
Ingress protection: IP67/ IP65  
Frequency range: 26GHz  
Power supply: (6 - 24V) DC / Four-wire  
24V DC / Two wire  
Signal output: 4-20mA /RS485/ Modbus

**2.9 RD909**

Application: Rivers, lakes, shoal

Measuring range: 70 meters

Process connection: Thread G1½" A/frame /flange

Process temperature: -40°C~100°C

Process pressure: Normal pressure

Precision: ±10mm

Ingress protection: IP67/ IP65

Frequency range: 26GHz

Power supply: (6 - 24V) DC / Four-wire

24V DC / Two-wire

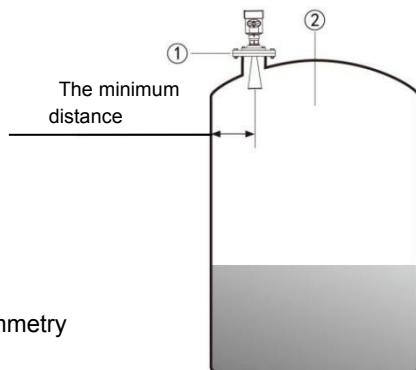
Signal output: 4-20mA / RS485 / Modbus

## Chapter 3 The Installation Requirements

### 3.1 Installation

Be installed in the diameter of the 1/4 or 1/6.

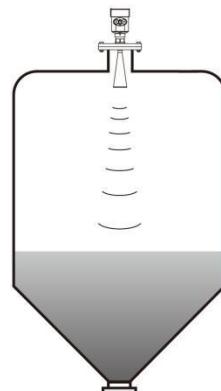
Note: The minimum distance from the tank wall should be 200mm.



Note: ① Datum

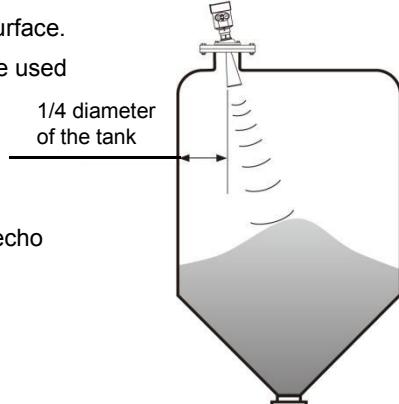
② The container center or axis of symmetry

- The top conical tank level, can be installed at the top of the tank is intermediate, can guarantee the measurement to the conical bottom.



- A feed antenna to the vertical alignment surface. If the surface is rough, stack angle must be used to adjust the angle of cardan flange of the antenna to the alignment surface.

(Due to the solid surface tilt will cause the echo attenuation, even loss of signal.)

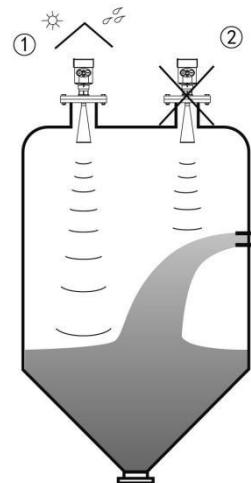


### 3.2 Typical installation errors

Conical tank cannot be installed above the feed port.

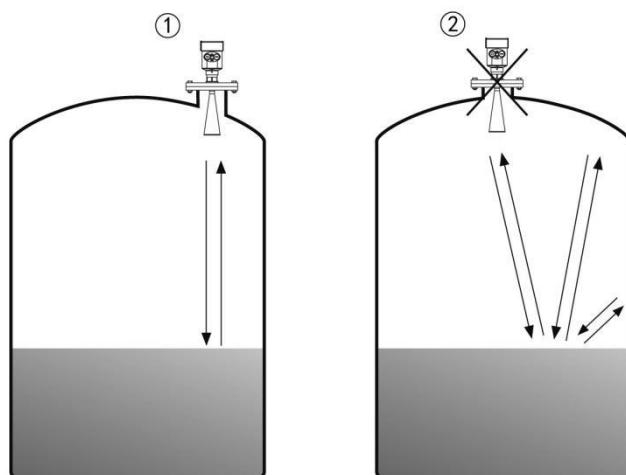
**Note:** outdoor installation should adopt sunshade.

- ① Correct
- ② Error rainproof measures

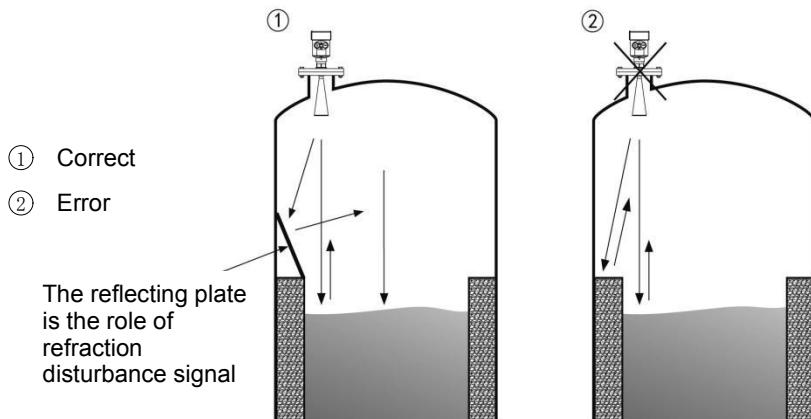


The instrument cannot be installed in the arched or domed roof intermediate. In addition to produce indirect echo is also affected by the echoes. Multiple echo can be larger than the real value of signal echo, because through the top can concentrate multiple echo. So cannot be installed in a central location.

- ① Correct
- ② Error

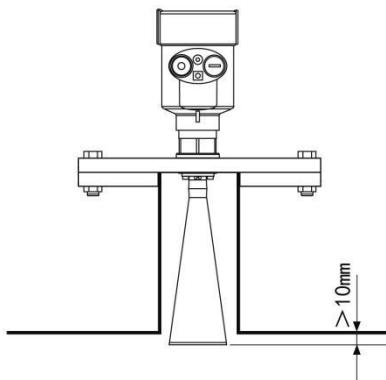


There are obstacles affecting measurement needed reflection plate.

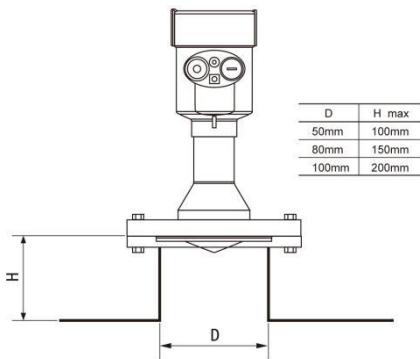


### 3.3 Height of nozzle:

Antenna extends into the tank at least 10mm distance.



### RD906 installation diagram:



## Chapter 4 The Electrical Connection

### 4.1 The power supply voltage

(4~20)mA/HART (Two-wire system)

The power supply and the output current signal sharing a two core shield cable. The supply voltage range see technical data. For intrinsically safe type must be a safety barrier between the power supply and the instrument.

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(4~20)mA/HART(Four-wire system)

Separate power supply and the current signal, respectively using a two-core shielded cable. The supply voltage range see technical data.

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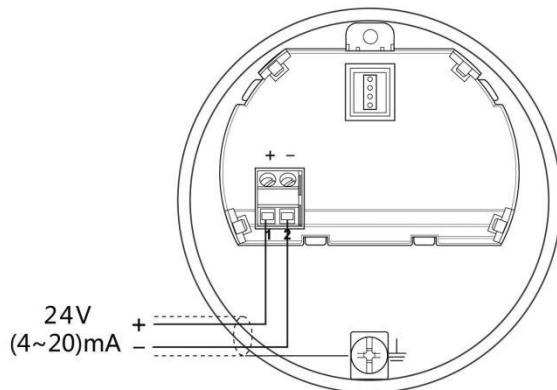
RS485/Modbus

Power supply and Modbus signal line separated respectively using a two-core shielded cable, the power supply voltage range see technical data.

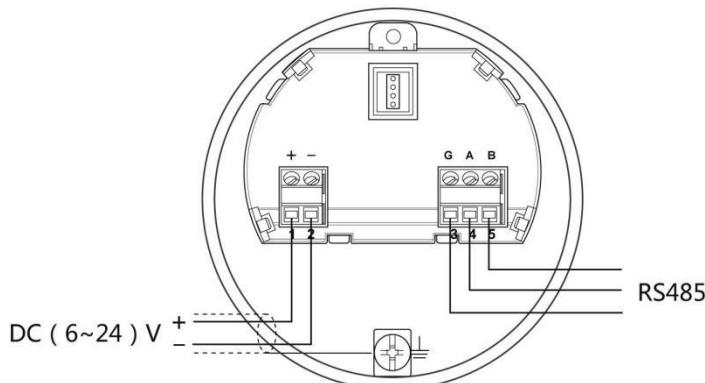
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#### 4.2 Connection mode

24V two wire wiring diagram as follows:



6~24V RS485/Modbus wiring diagram as follows:



#### 4.3 Safety instructions

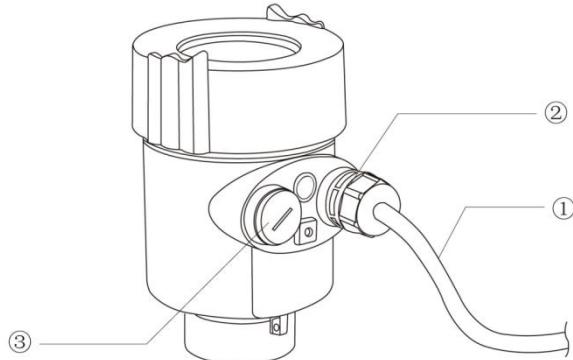
- Please observe the local electrical code requirements.
- Please comply with local requirements for personnel health and safety regulations.

All electrical components of instrument operation must be completed by the formal training of professionals.

- Please check the instrument nameplate to provide product specifications meet your requirements. Please make sure that the power supply voltage and instrument nameplate on the requirements.

#### 4.4 Ingress protection

This instrument meets the protection class IP66/67 requirements, please ensure the waterproof cable sealing head. The following diagram:



**How to install to meet the requirements of IP67:**

- Please make sure that the sealing head is not damaged.
- Please make sure that the cable is not damaged.
- Please make sure that the cable for use with electrical connection specification.
- Cable into the electrical interface before its curved downward, ensure that the water will not flow into the shell, see the①
- Tighten the cable seal head, see the②
- Please electrical interface will not use blind plug tight, see the③

## Chapter 5 Instrument Commissioning

- **There are three kinds of debugging method:**

- 1) Display / keyboard
- 2) Host debugging
- 3) HART handheld programmer

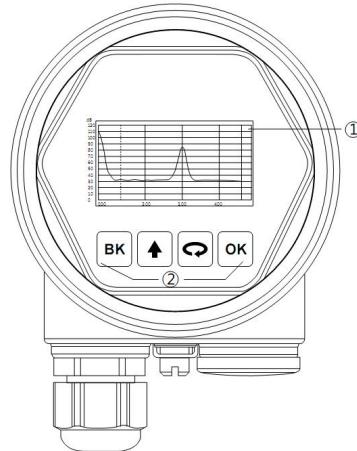
- **Display / keyboard:**

Please debug the instrumentation by four buttons on the display screen. There are three debug menu languages optional. After debugging is generally used only for display, through the glass window can read measured value very clearly.

Display / keyboard

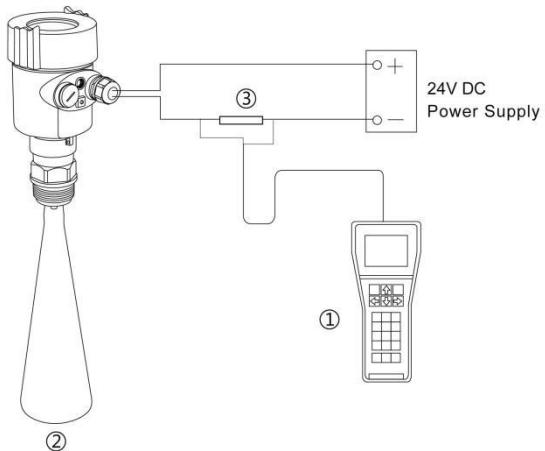
① Liquid crystal display(LCD)

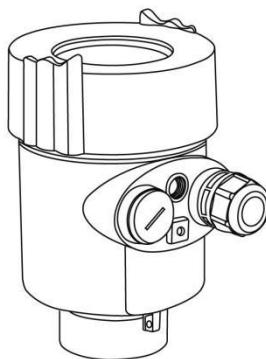
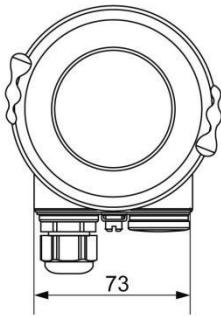
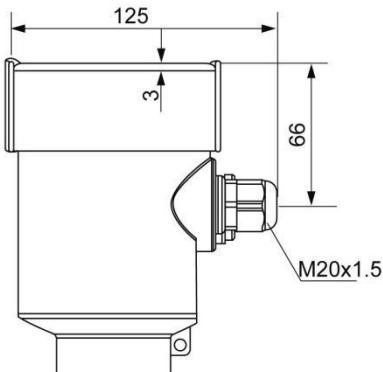
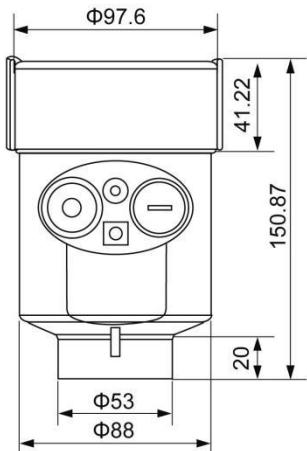
② The key

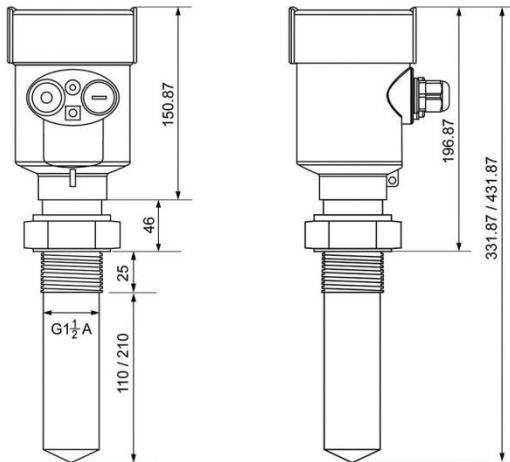
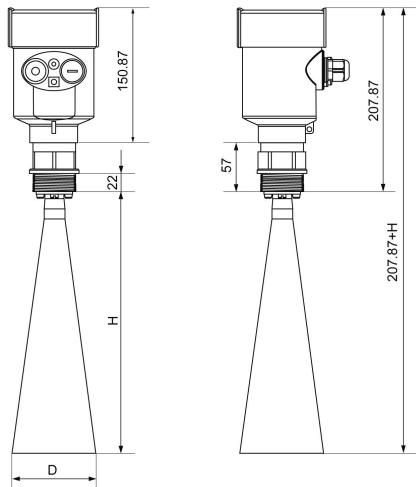


- **HART handheld programmer:**

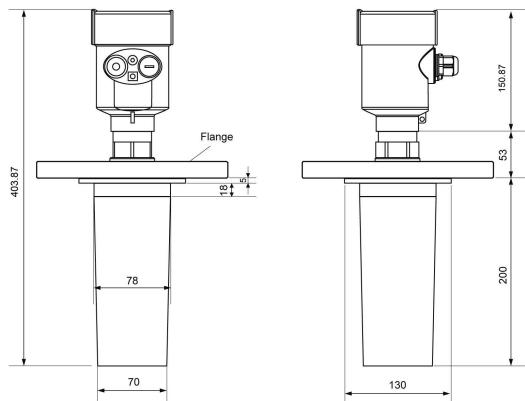
- ① HART handheld programmer
- ② Radar level meter
- ③ 250 Ω resistor



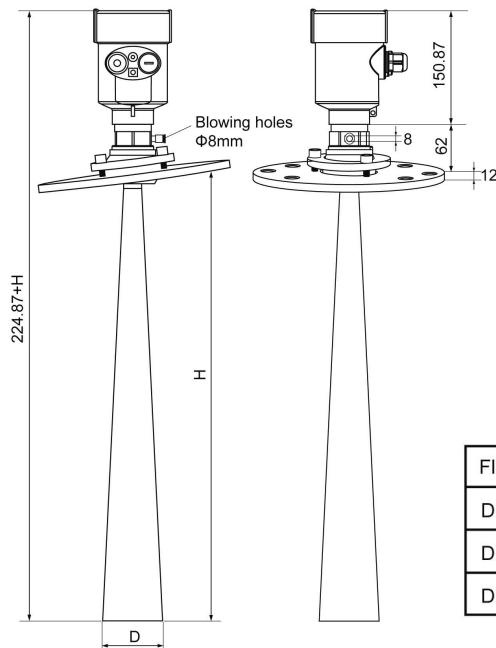
**Chapter 6 Structure Size (Unit: mm)****● The outer shell:**

**● Appearance size:****RD901****RD902**

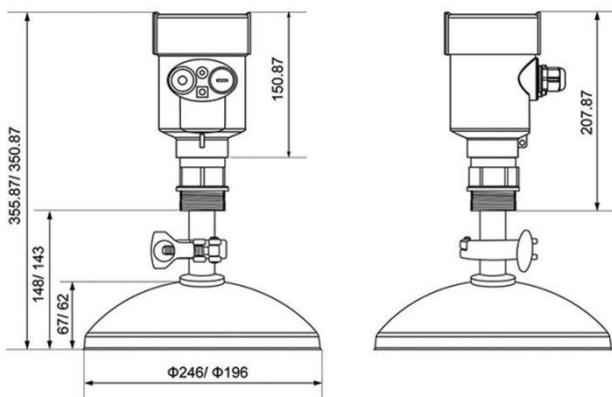
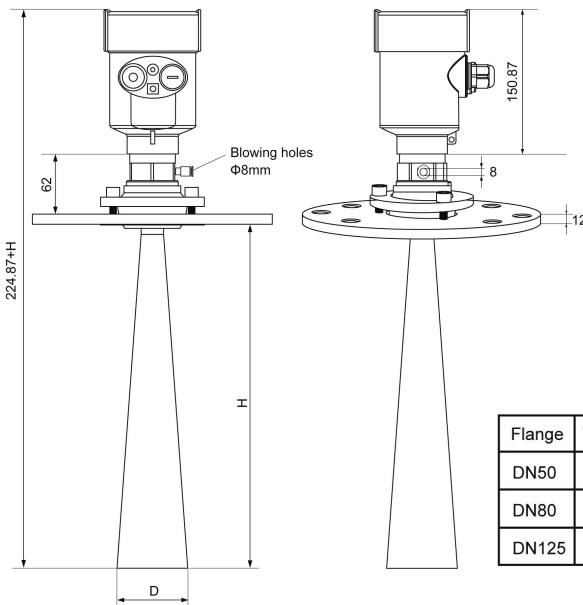
Flange	Trumpet diameter D	Trumpet height H
DN50	Φ46	140
DN80	Φ76	205
DN100	Φ96	290

**RD902T**

Flange	The Bell Diameter D	Bell height H
DN80	Φ65	185
DN100	Φ65	185

**RD903**

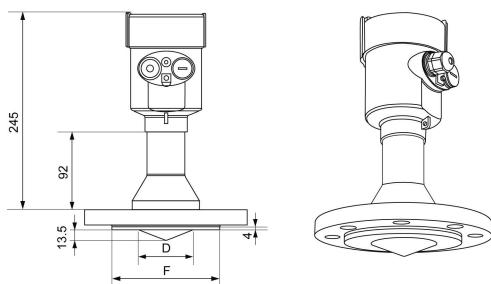
Flange	Trumpet diameter D	Trumpet height H
DN50	Φ76	205
DN80	Φ96	290
DN125	Φ121	610

**RD904****RD905**

Flange	Trumpet diameter D	Trumpet height H
DN50	Φ76	205
DN80	Φ96	290
DN125	Φ121	610

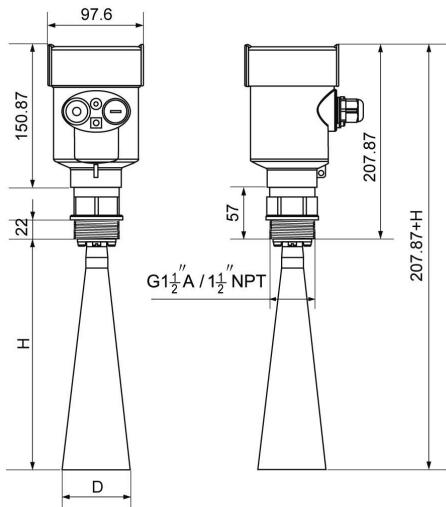
## RD906

Standard type



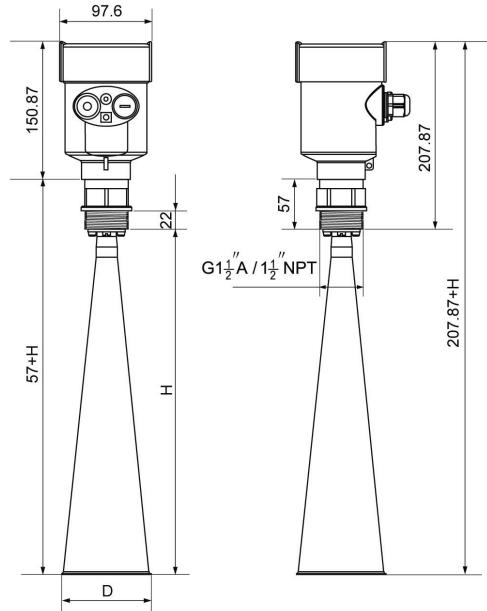
Flange	Trumpet diameter D	Sealing surface diameter F	Number of holes and hole diameter
DN50	Φ46	100	4×Φ18
DN65	Φ46	120	4×Φ18
DN80	Φ76	135	8×Φ18
DN100	Φ76	155	8×Φ18
DN125	Φ76	185	8×Φ18
DN150	Φ76	210	8×Φ23

## RD908



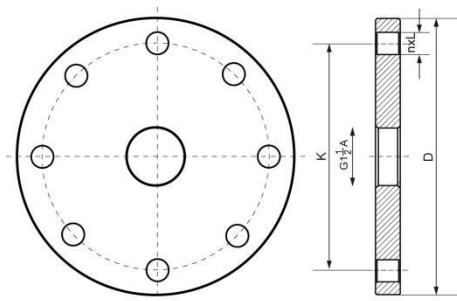
Flange	Trumpet diameter D	Trumpet height H
DN50	Φ46	140
DN80	Φ76	205
DN100	Φ96	290

## RD909



Flange	Trumpet diameter D	Trumpet height H
DN80	Φ76	205
DN100	Φ96	290
DN125	Φ121	610

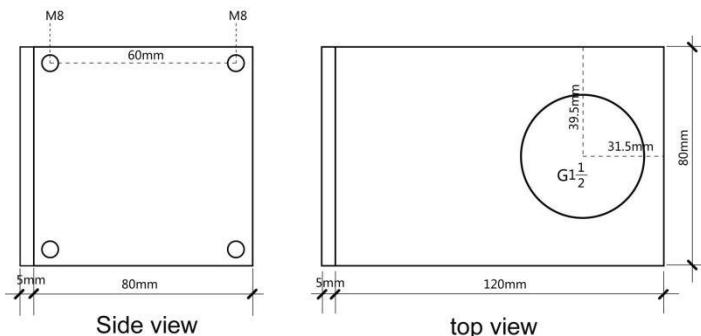
- Flange type:



Flange Selection Tables				
Specification	Outer diameter D	Hole center distance K	Number of Holes n	Hole diameter L
DN50	Φ165	Φ125	4	18
DN80	Φ200	Φ160	8	18
DN100	Φ220	Φ180	8	18
DN125	Φ250	Φ210	8	18
DN150	Φ285	Φ240	8	22
DN200	Φ340	Φ295	12	22
DN250	Φ405	Φ355	12	26

- Standard bracket(RD908/ 909)

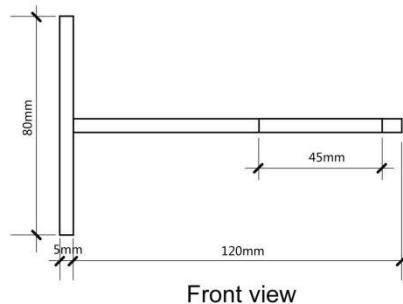
Attachment bracket dimension drawing



With rain cov

Thread G1 1/2

G1 1/2 mountir



## Chapter 7 Technical Parameters

<b>Process Connection</b>	Thread G1½" A Thread 1½" NPT Flange	
<b>Antenna Material</b>	Stainless Steel	
<b>The outer shell</b>	The seal between the shell and the shell cover Silicone rubber Casing window Polycarbonate The ground terminal Stainless steel	
<b>The power supply voltage</b>		
Two wire system	The standard type Intrinsically safe Power dissipation - <100Hz - (100~100K) Hz	(16 ~ 26) VDC (21.6 ~ 26.4)V DC max 22.5mA / 1W Uss<IV Uss<10mV
Flameproof	(22.8 ~ 26.4) V DC (198 ~242)V AC AC	2-wire system 4-wire system / 110V
4-wire system		
<b>The cable parameters</b>		
Cable entrance / plug	1 M20x1.5 cable entrance 1 blind plug	
Terminal	Conductor cross section 2.5mm <sup>2</sup>	
<b>Output parameters</b>		
The output signal	(4 ~ 20) mA/RS485	
Communication protocol	HART 1.6 µ A	

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Resolution	Constant current output;
Fault signal	20. 5mA 22mA 3.9mA
	(0 ~ 36) s, adjustable
<b>The integral time</b>	
<b>Blind area</b>	the ends of the antenna
<b>Microwave frequency</b>	26GHz
<b>Communication interface</b>	HART communication protocol
<b>The measurement interval</b>	
	about 1 second (depending on the parameter settings)
<b>Adjust the time</b>	about 1 second (depending on the parameter settings)
<b>Display resolution</b>	1 mm
<b>Working storage and transportation temperature</b>	
	(-40~80) °C
<b>Seismic</b>	Mechanical vibration 10m/s <sup>2</sup> , (10 ~ 150) Hz

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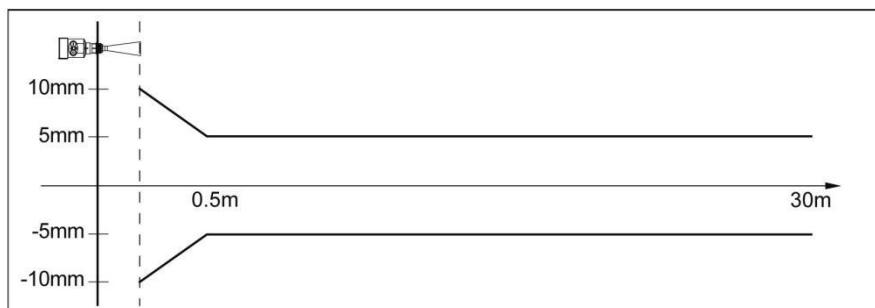
## Chapter 8 Meter Linearity

**SUP-RD902**

Emission angle      Depending on the size of the antenna

- Ø 46mm	18°
- Ø 76mm	12°
- Ø 96mm	8°
- Ø 121mm	6°

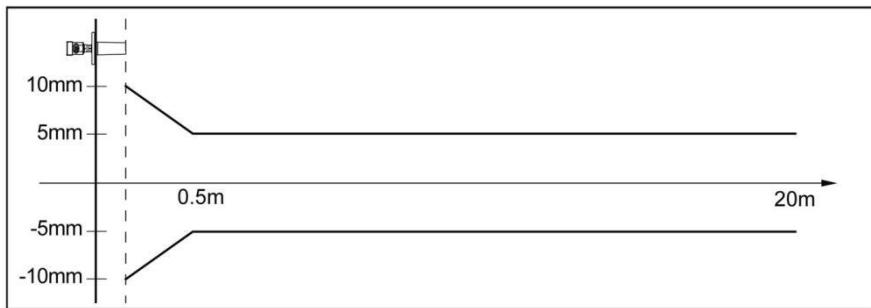
Precision See chart



**SUP-RD902T**

Emission angle Depending on the size of the antenna

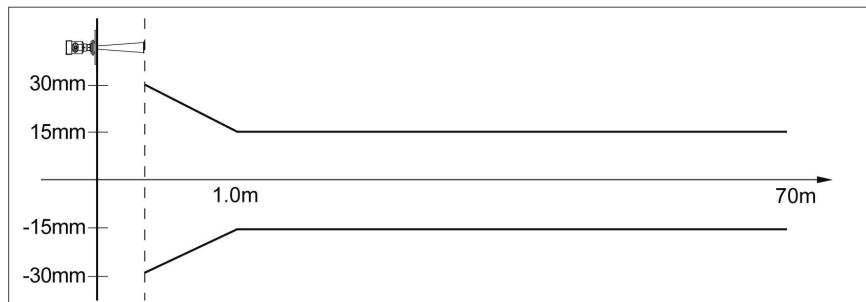
-  $\varnothing$  63mm 14°  
Precision See chart



**SUP-RD903**

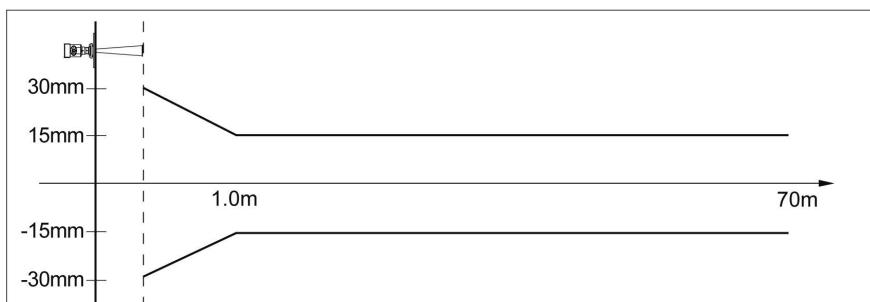
Emission angle Depending on the size of the antenna

- $\varnothing$ 46mm	18°
- $\varnothing$ 76mm	12°
- $\varnothing$ 96mm	8°
- $\varnothing$ 121mm	6°
Precision	See chart

**SUP-RD905**

Emission angle Depending on the size of the antenna

- $\varnothing$ 76mm	12°
- $\varnothing$ 96mm	8°
- $\varnothing$ 121mm	6°
Precision	See chart



**SUP-RD906**

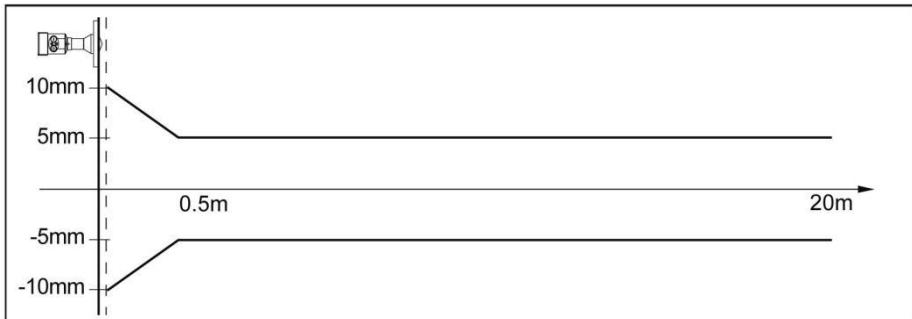
Emission angle Depending on the size of the antenna

-  $\varnothing$  76mm

12°

Precision

See chart

**SUP-RD908**

Emission angle Depending on the size of the antenna

-  $\varnothing$  76mm

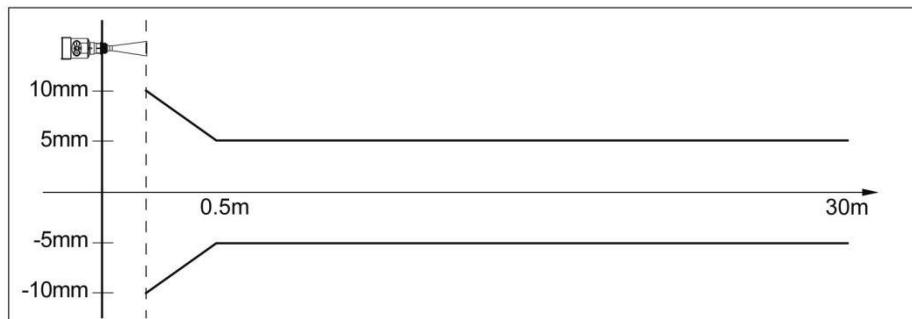
12°

-  $\varnothing$  96mm

18°

Precision

See chart



**SUP-RD909**

Emission angle Depending on the size of the antenna

-  $\varnothing$  76mm  $12^\circ$

-  $\varnothing$  96mm  $18^\circ$

-  $\varnothing$  121mm  $6^\circ$

Precision See chart

